GA63
C2A3
1927/28

DOMINION OF CANADA

DEPARTMENT OF THE INTERIOR

Hon. Charles Stewart, Minister — W. W. Cory, C.M.G., Deputy Minister

J. D. Craig, Director General of Surveys — F. H. Peters, Director, Topographical Survey

ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEY

FOR THE

FISCAL YEAR ENDED MARCH 31, 1928

RECEIVED
JAN - 8
McPHERSON LIBRARY
UNIVERSITY OF VICTORIA

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1929

Price, 10 cents

DOMINION OF CANADA

DEPARTMENT OF THE INTERIOR

Hon. Charles Stewart, Minister — W. W. Cory, C.M.G., Deputy Minister

J. D. Craig, Director General of Surveys — F. H. Peters, Director, Topographical Survey

ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEY

FOR THE

FISCAL YEAR ENDED MARCH 31, 1928

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1929

TABLE OF CONTENTS

	Page
Résumé of Operations for the Year	5
Topographical and Photo-topographical Surveys	7
Aerial Surveys	9
Control and Exploratory Surveys	11
Land Surveys	14
Land Classification Surveys	17
Precise Declination Surveys	17
Physical Testing Laboratory	19
Registration, Records and Distribution	21
Mechanical Operations	23
Geographic Board of Canada	24
Board of Examiners for Dominion Land Surveyors	24

APPENDIX

Schedule of Surveyors employed and work executed by them	26

MAPS

78972—1½

REPORT

OF THE

TOPOGRAPHICAL SURVEY, DEPARTMENT OF THE INTERIOR

FOR THE FISCAL YEAR ENDED MARCH 31, 1928

During the fiscal year of 1927-28, field work was carried on in eight of the nine provinces of Canada. In such a wide range of territory the immediate requirements naturally varied greatly. In all cases, however, the fundamental requirement of the extension of the national topographic map of Canada was kept in mind and the work all contributed, in a greater or less degree, toward it.

In Nova Scotia, field work was carried on in the southwestern corner; in New Brunswick the work was designed to assist lumbering operations and forestry administration; in Quebec, the work was done chiefly in water-power and mining districts; in Ontario and northern Manitoba the rapid extension of mining fields made new surveys essential; in the great agricultural districts of Western Canada the necessity of continuing to provide road and general development maps was not lost sight of; in the Rocky Mountains region of Alberta considerable work was done in connection with the further development of our national parks; while in the interior of British Columbia mapping to aid in the intensive development of the varied natural resources was continued.

Wherever possible, use was made of aerial photographs and there was a continuation of the co-operation with the Royal Canadian Air Force whereby the Topographical Survey is the central organization for issuing instructions, preparing specifications and keeping record of all civil aerial photographic operations.

RÉSUMÉ OF OPERATIONS FOR THE YEAR

Topographical and Photo-topographical Surveys.—Surveys for the purpose of preparing base maps showing natural and cultural details and for use in agricultural, water-power, mining, and forestry development; in Dominion parks, forestry, municipal, and property administration; in the location of highways and railways, and for other purposes.

New mapping covered 7,353 square miles distributed as follows:—

Province	Square Miles
Nova Scotia	184
New Brunswick	291
Quebec	460
Saskatchewan	4,218
Alberta	1,230
British Columbia	970

In addition, a second field revision was made of 2,550 square miles in the Province of Manitoba, and some experimental work was done in Ontario.

Aerial Surveys.—Preparing the instructions for all aerial photographic surveys undertaken by the Dominion Government; directing the navigation of the aircrafts and the operations of the aerial photographers; constructing mosaics

from vertical aerial photographs and compiling topographic maps from both vertical and oblique aerial photographs; indexing, recording, and filing aerial photographs, and selecting and supplying copies of these as requested.

The aerial photographic surveys during the past fiscal year were for general topographical mapping and map revision; mapping of timber types; forest protection; investigation, and development of the mineralized and forested areas of northern Canada; location of transmission lines; reconnaissance for railway location, irrigation surveys, town planning, road construction; investigation of water-power development and water storage; development of tourist traffic; and for administrative, educational, and illustrative purposes.

The year's work covered 45,850 square miles exclusive of the areas covered by operations conducted for experimental or illustrative purposes only, distributed as follows:—

Province	Square Miles
Nova Scotia	1,500
New Brunswick	440
Quebec	6,404
Ontario	5,510
Manitoba	17,383
Saskatchewan	5,400
Alberta	9,188
British Columbia	25

Control and Exploratory Surveys.—Control surveys as a basis for topographical mapping were continued in Ontario, Quebec and New Brunswick as shown in the following table:—

	Number of Monuments Established	Traverse		Levels	
		Chain	Stadia	Spirit	Stadia
		miles	miles	miles	miles
New Brunswick	40	130	162	122	165
Ontario	215	760	.....	1,002	.....
Quebec	187	657	51	554	39

In addition, in connection with topographical mapping, 203 miles of spirit levels were run in Manitoba and stadia levels to the extent of 30 miles in Nova Scotia, 1,010 miles in Saskatchewan and 385 miles in British Columbia. Explorations and mapping work were conducted in the Wood Buffalo Park area near Fort Smith, N.W.T., and in northeastern British Columbia.

Land Surveys.—Survey of town and settlement lots, timber berths, Indian and other reserves, re-establishment of lost corners, retracement and correction surveys, township subdivision, and survey of water areas.

Land Classification Surveys.—These surveys comprise a thorough field investigation of the land resources and provide a record of the acreage of the different grades of available land within investigated districts.

During the year an aggregate of 434,080 acres was examined, comprising 147,360 acres in the Province of Alberta and 286,720 acres in the Province of Saskatchewan.

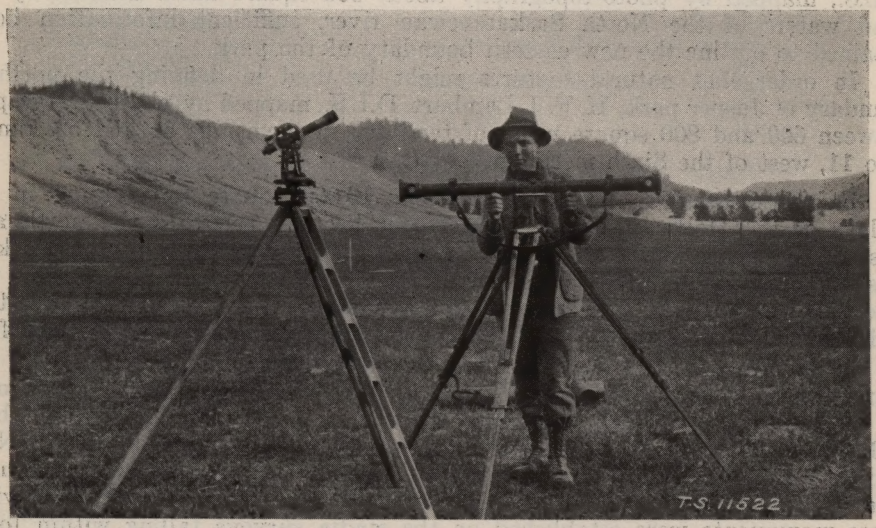
Other Work.—In addition to the above and to the regular work of administration, the other activities of the Topographical Survey are included under the headings of Precise Declination Surveys; Physical Testing Laboratory; Registration, Records, and Distribution; Mechanical Operations; Geographic Board of Canada; and Board of Examiners for Dominion Land Surveyors.

TOPOGRAPHICAL AND PHOTO-TOPOGRAPHICAL SURVEYS

During the field season of 1927 topographical surveying was carried on in every province of Canada except Prince Edward Island. An area of 7,353 square miles of new mapping and a secondary field revision of 2,550 square miles were completed. In addition an area of about 10,000 square miles of hitherto unknown territory lying in the valleys of the Halfway and Prophet rivers in northeastern British Columbia was explored and mapped. The use of vertical aerial photographs as an aid to topographical mapping was continued in both the one- and the two-mile-to-the-inch mapping and considerable progress has been made in this method. To supplement control for topographical mapping the surveyors in charge ran 1,881 miles of spirit levels and 1,629 miles of stadia levels.

Following is a short description of the field work accomplished:—

Nova Scotia.—A. L. Cumming, D.L.S., completed the mapping of the Yarmouth and Comeau Hill sheets, Nos. 20 0/16 and 20 0/9, respectively, of the National Topographic series for publication at a scale of one mile to the inch with a contour interval of fifty feet. These two map sheets cover areas



RANGE-FINDER AND TRANSIT

The range-finder has been adapted to the work of mapping by the Topographical Survey. The particular arrangement shown in the photograph where it has been mounted on a tripod and fitted with a horizontal azimuth circle, is one of the devices in this connection worked out by this organization.

situated in the extreme southwest end of the province and comprise a total land area of about 184 square miles. Vertical photographs were used.

New Brunswick.—G. A. Bennett, D.L.S., completed the mapping of the Fredericton one-mile sheet, No. 21 G/15, with a contour interval of twenty-five feet, and established a portion of the control necessary for the mapping of the Moncton two-mile sheet, No. 21 I/S.E. The Moncton sheet includes the city of Moncton and the well-populated suburban and rural areas in the counties of Kent, Westmorland, and Albert.

Quebec.—About 460 square miles of the Beaupré sheet, No. 21 M/S.E., of the National Topographic series, was controlled and mapped by C. Rinfret, D.L.S., at a scale of two miles to the inch and with a contour interval of 100 feet. Vertical aerial photographs were used. The sheet is about 1,600 square miles in area and centres on the St. Lawrence river below Quebec city.

Ontario.—A small area in the vicinity of Carillon falls, on the Ottawa river, was mapped at a scale of 400 feet to the inch with a contour interval of five feet, and an area of about 90 square miles in the Muskoka district was mapped from vertical aerial photographs for experimental purposes.

Manitoba.—A second field revision of 2,550 square miles forming part of the area covered by the Selkirk sheet, No. 62 I, of the National Topographic series, was made by C. S. Macdonald, D.L.S. The area includes the farming district to the north of Winnipeg.

Saskatchewan.—G. C. Cowper, D.L.S., made a first revision of the Humboldt sheet, No. 219, of the Sectional Map series.

Alberta.—E. Bartlett, D.L.S., under the supervision of M. P. Bridgland, D.L.S., completed the mapping of the Calgary Southwest one-mile sheet, No. 82 J/16, and a small area on the Calgary Northwest one-mile sheet, No. 82 0/1, of the National Topographic series, with a contour interval of twenty-five feet. Vertical aerial photographs were used.

In connection with the proposed extension of Jasper park, M. P. Bridgland, D.L.S., mapped by photo-topography about 300 square miles drained by the head waters of the North Saskatchewan river, sufficient information being obtained to outline the new eastern boundary of the park.

In order that natural features might be used in defining the northern boundary of Jasper park, H. F. J. Lambart, D.L.S., mapped by photo-topography between 600 and 800 square miles of territory in townships 51 and 52, ranges 1 to 11, west of the Sixth meridian.

British Columbia.—An area of about 10,000 square miles lying in the valleys of the Halfway, Sikanni Chief and Prophet rivers to the north and west of the Peace River Block and extending to the foothills of the Rockies, was explored by K. F. McCusker, D.L.S. As a result of this survey two sheets of the National Topographic series, namely, Halfway River, No. 94 B, and Prophet River, No. 94 G, will be issued with a contour interval of 500 feet.

C. H. Taggart, D.L.S., completed the field work for the mapping of the Kamloops Lake two-mile sheet, No. 92 I./N.E., an area of 250 square miles on the Shuswap Lake two-mile sheet, No. 82 L./N.W., and an area of about 250 square miles on the Yale and Lytton two-mile sheets, Nos. 92 H./N.W. and 92 I./S.W. Both photo-topographical and plane-table methods were used. The triangulation net was extended to control this mapping. As in previous years monuments were established on the stadia surveys falling within forest reserves.

L. E. Harris, D.L.S., under the supervision of M. P. Bridgland, D.L.S., mapped an area of about 300 square miles on the Revelstoke two-mile sheet, No. 82 L./N.E., with a contour interval of one hundred feet. Photo-topographical methods were used.

Office Work.—Instructions to the field staff for the surveys of 1927 were prepared and information collected from different sources to assist in the field work. A large percentage of the office work of the division has been the collection of all available information from ground surveys in areas selected to be covered by aerial photography and the compiling of this information on projection sheets for the purpose of controlling the geographic positions of the topography added from aerial photographs. This entailed work on twenty-six four-mile map sheets of the National Topographic series.

Other activities of the office staff have been the preparation of key, magnetic, and dummy maps, the preparation of place-name lists for submission to the Geographic Board, the preparation of specifications for each map to be issued, the compilation and assembly of manuscript, and the checking of

manuscript and proofs for each map edition. Spirit levels and stadia levels run for the control of topographical mapping are examined and filed by this division.

Of the National Topographic series, the following sheets were issued:—

New Glasgow		1 inch=1 mile
Sussex		do.
Rouyn Lake	(Provisional Edition)	1 inch=2 miles
Rouyn-Larder Lake	" "	do.
Cormorant Lake	" "	1 inch=4 miles
Wekusko Lake	" "	do.
Grand Rapids	" "	do.
The Pas	" "	do.
Trout Lake	" "	do.

The following sheets were compiled:—

Calgary Northeast		1 inch=1 mile
Fredericton		do.
Shawinigan		do.
Sorel		do.
Wolfville		do.
Comeau Hill		do.
Calgary Southwest		do.
Yarmouth		do.
Kamloops Lake		1 inch=2 miles
Kississing	(Provisional Edition)	1 inch=4 miles
Sioux Lookout	" "	do.
Halfway River	(Exploratory Edition)	do.
Prophet River	" "	do.
Alexandra Falls	" "	do.

Of the Sectional Map series, the following sheets were issued:—

Edmonton (second revision)	1 inch=3 miles
Vermilion	do.
Saskatoon	do.
Touchwood	do.

The following sheets were compiled:—

Humboldt	1 inch=3 miles
Battleford	do.

Of the miscellaneous maps the following were issued:—

Yoho Park	Kootenay Park
Churchill Harbour	Northwestern Canada

The Regina sheet of the International Map of the World series has been compiled.

AERIAL SURVEYS

During the fiscal year 1927-28, as in the previous year, nearly all the oblique aerial photographic surveys were carried out by flying boats operating from the Winnipeg air base or from sub-bases in that region. From these surveys detailed topographical information was obtained for mapping in whole or in part fourteen sheets of the National Topographic series on the scale of four miles to one inch in the following areas of Manitoba and Northwestern Ontario:—

Kississing, Cross Lake, Norway House, Swan River, Waterhen, Berens River, Island Lake, Deer Lake, Gypsumville, Hecla, Lake St. Joseph, Kenora, Dryden, and Ignace.

Cross Lake, Norway House, and Berens River areas were photographed principally to select the lands on which licenses to cut pulpwood were to be granted by the Dominion Government, and to secure an estimate of the amount of pulpwood in these areas. Preliminary maps classifying the forested areas into five grades were prepared by hand from oblique aerial photographs for the Dominion Forest Service to guide the ground parties in their cruising. Timber

type maps for the use of the Dominion Forest Service were also prepared of adjacent localities. The total area covered by these specially prepared maps, which numbered eighteen in all, comprised some 35,000 square miles in the vicinity of lake Winnipeg.

Kississing, Island Lake, and Deer Lake areas are attracting attention owing to their promising mineral possibilities, and these maps greatly assist in the exploration and development of the mineral resources in these regions.

One of the most interesting developments of the past year in aerial survey research has been the utilization of vertical aerial photographs in the investigation of water-power development, water storage, and other engineering projects. In cases where field work is necessary a preliminary study of the photographs will reduce it to a minimum and will enable the engineer to report definitely after only a few careful measurements at critical points. In Canada, where hydro-electric development is so often in wooded country, at points difficult of

ISLAND FALLS ON CHURCHILL RIVER

This vertical view is of the falls on the west side of the island. In addition to their regular value for mapping purposes, aerial photographs are a wonderful aid in the study and investigation of water-power and other projects wherein large areas are affected. The photographs in effect present the ground surface in miniature before the eyes of the observer, especially when the stereoscope is used, and they eliminate a great deal of arduous and expensive ground work.

access, this new application of aerial photographic investigation promises to be immeasurably useful to engineers. Aerial photographs have also been useful in the location of transmission lines, and reconnaissance for railway location, with results that could be obtained in no other way in the same time and with the same expenditure.

Most of the vertical aerial photographic operations were carried on in Eastern Canada, in the regions of Shelburne in Nova Scotia; Saint John in New Brunswick; Beaupré, La Tuque, and Buckingham in Quebec; and Muskoka and Sudbury in Ontario. Of the operations carried on in Western Canada the most extensive were north of Neepawa in Manitoba; east of Prince Albert in Saskatchewan; and in the vicinity of Calgary and Red Deer in Alberta.

During the past fiscal year detailed instructions to accompany fifty-two operation orders were written, and guide maps were prepared to show the projected lines of flight. Five Dominion Land Surveyors accompanied the crews of the aircrafts as navigators.

Aerial surveys during the year covered an approximate area of 45,850 square miles, 28,650 square miles being covered by oblique and 17,200 square miles by vertical photographic surveys.

From the surveys performed during the year, the compilation of the following sheets of the National Topographic series will be completed:—

Kississing	Scale 1 inch=4 miles		Deer Lake	do.	do.
Cross Lake	do.	do.	Lake St. Joseph	do.	do.
Norway House	do.	do.	Kenora	do.	do.
Berens River	do.	do.	Muskoka	Scale 1 inch=2 miles	
Island Lake	do.	do.			

Oblique aerial photographic surveys were also made of two areas in northwestern Ontario, four areas in Manitoba west of lake Winnipeg, an area of 8,000 square miles in the Wood Buffalo park in Alberta, and an area of 2,650 square miles in the Prince Albert national park in Saskatchewan. Six sheets of the National Topographic series on the scale of one inch to four miles are involved, but the preparation of these sheets is being withheld until further ground control or aerial surveys have been carried out over these areas.

Mosaics were constructed from vertical photographs taken during the year for the following areas: Chicoutimi, P.Q.; St. Maurice River, from La Tuque to Weymont, P.Q.; High Falls on Lièvre river, P.Q.; Hawkesbury, Ont.; St. Catharines, Ont.; Port Arthur and Fort William, Ont.; Welland Canal, Ont.; Niagara Falls, Ont.; Esquimalt, B.C.

Prints of all aerial photographs taken for the Dominion Government are recorded, indexed, and filed by this division where they are available for inspection. During the year, 62,000 aerial photographs were received for the index and 63,000 additional prints were received for constructing mosaics, furnishing surveyors in the field, supplying officials of provincial governments, city engineers, mining and lumbering corporations, municipalities, and the general public.

CONTROL AND EXPLORATORY SURVEYS

A pleasant feature in connection with the topographical operations of this Branch in the older provinces is the very encouraging manner in which the provincial survey branches are co-operating in this work by placing copies of the records of their official surveys at the disposal of the Survey, and in arranging their annual survey programs so that their land surveys will so far as possible provide control for our mapping operations, thus eliminating the necessity and expense on the part of this Department of the carrying out of a very considerable amount of control surveys.

In the province of Ontario there has grown up a rapidly-increasing demand for topographic maps of mining areas, timbered lands, water-power sites and drainage basins, and for tourists' use. This was not being met by the ordinary annual mapping program and for this reason the Minister of Lands and Forests and the Surveyor General of Ontario last year inaugurated the survey of a major base line that will ultimately extend across northern Ontario from Manitoba to the Quebec boundary. Three parties were placed in the field on this work, and the line, as opened up, is easily visible from the air and will provide control for later mapping. Advantage was taken of the opportunity and the Department attached a levelling party to each of the provincial survey parties, thereby securing valuable information. Arrangements have been made for a continuation of this work during the present season.

In the province of Quebec the provincial officials have co-operated with this department in the production of maps for developing and administering the natural resources of the province and for the many other purposes for which maps are a necessity, and have freely placed at the disposal of the Survey copies of the records of their provincial surveys for control purposes.

In New Brunswick, Nova Scotia, and British Columbia the provincial officials have shown the same spirit of co-operation. In New Brunswick two provincial surveyors were employed during last season in tying in provincial lot lines to the control surveys being carried out in that province by this department, in order to furnish additional control, and the province pays the cost of the posts manufactured and planted by this department on control surveys carried out in that province. Nova Scotia also manufactures and supplies the posts planted by this department on control surveys in that province, and Ontario has, by Order in Council, legalized and confirmed monuments in and for that province that are planted on control surveys by members of this Survey who are qualified Ontario land surveyors, when the province has been furnished with copies of the official records.

Control Surveys in Ontario.—Control surveys were made in the Muskoka area in co-operation with the Department of Lands and Forests of Ontario, and two Ontario land surveyors were engaged on this work under the direction of J. W. Pierce, D.L.S., O.L.S. The area covered by these surveys is included between latitudes 44° 30′ and 45° 30′, longitudes 79° 00′ and 80° 00′, and between latitudes 45° 00′ and 45° 30′, longitudes 80° 00′ and 81° 00′, and will provide control for mapping three map sheets on a scale of two miles to the inch from aerial photographs. A total of 760 miles of chained traverse was run and 215 permanent monuments were established here, the positions being based on the positions of points established in the southern part of the area by the Geodetic Survey of Canada. Spirit levels were run over all the chained traverse lines. In addition levellers attached to provincial survey parties but working under instructions from the Topographical Survey, ran 242 miles of spirit levels.

Control Surveys in Quebec.—Surveys were made by W. A. Fletcher, D.L.S., for obtaining the ground control required for the topographical mapping on a scale of two miles to the inch of the Buckingham and Lachute sheets from vertical aerial photographs. These two sheets cover the area between latitudes 45° 30′ and 46° 00′ and longitudes 74° 00′ and 76° 00′. Both horizontal and vertical measurements were controlled by the positions of points established by the Geodetic Survey of Canada, to which ties were made. In this area a total of 440 miles of chain traverse and 17 miles of stadia traverse were run. Permanent monuments were established approximately three miles apart along the chained traverse lines. During the season 138 permanent monuments were established.

C. Rinfret, D.L.S., carried out a portion of the surveys required for establishing on the ground the control for mapping on a scale of two miles to the inch the Beaupré sheet, which covers the area between latitudes 47° 00′ and 47° 30′ and longitudes 70° 00′ and 71° 00′. It is proposed to have the surveys completed in this area during 1928. Permanent monuments were established approximately three miles apart along the chained traverse lines. During the season 49 monuments were established and 217 miles of chained traverse and 34 miles of stadia traverse were run.

Control Surveys in New Brunswick.—The control surveys required for the topographical mapping on a scale of two miles to the inch of the Moncton sheet which covers the area between latitudes 46° 00′ and 46° 30′ and longitudes

64° 00′ and 65° 00′ were made by G. A. Bennett, D.L.S. Permanent monuments were established approximately three miles apart along the chained traverse lines.

During the season there were run 130 miles of chained traverse, 162 miles of stadia traverse, 122 miles of spirit levels and 165 miles of stadia levels, and 40 permanent monuments were established.

The geographical positions of the permanent monuments thus established in Ontario, Quebec and New Brunswick are computed from the surveys through the ties obtained to Geodetic stations and their positions thus furnish points from which provincial or other surveys may be commenced or on which they may be closed.

Control Work in Other Provinces.—In connection with topographical mapping, 203 miles of spirit levels were run in Manitoba and stadia levels to the extent of 30 miles in Nova Scotia, 1,010 miles in Saskatchewan and 385 miles in British Columbia.

Exploratory Surveys.—Operations were conducted in the Wood Buffalo Park area near Fort Smith, N.W.T., under G. H. Blanchet, D.L.S., where explorations and mapping work were carried on with a view to determining the capacity of the park for buffalo and the best methods of developing its potentialities.

Explorations and investigations of an exploratory nature were carried on in northeastern British Columbia by K. F. McCusker, D.L.S., who accompanied a reconnaissance expedition sent out by a private company to investigate the country immediately north of Peace river and east of the Rocky mountains. The party left Peace river at Hudson Hope and proceeded in a northerly and westerly direction through the valleys of Halfway river and Prophet river and their tributaries. As a result of this expedition the country travelled through has been mapped and two exploratory sheets have been issued covering approximately 10,000 square miles of previously unknown territory.

SURVEYOR'S CAMP IN MUSKOKA DISTRICT

In carrying on mapping work in Canada, the surveyor must adapt himself to every kind of country, both settled and unsettled. A camp such as this one, where transport is by motor car and truck, presents a different aspect, for instance, than one in a newer section of the country. This camp is that of a survey party engaged in laying down control for later topographical mapping by means of aerial photographs.

Astronomical Observations for Position.—Observations for astronomical position were taken at seven points in the unsettled areas of Ontario and Manitoba as the most economical method of providing satisfactory control for mapping from aerial photographs. On this work a thorough field test was given to the method of determining position by observing the times at which stars cross a known altitude. The principle of equal altitudes, while utilized by a famous mathematician over 100 years ago, has only recently been investigated and modernized as a method of obtaining position with a minimum of field equipment, time and effort. The instrument employed by the field engineer in testing this method was an ordinary Cooke transit adapted to the method by fitting a prism and mercury horizon on the end of the telescope in order to enable him to simultaneously observe a star and its image in the mercury horizon. While some trouble was encountered due to the imperfections of the instrument, the experience proved that with a properly designed instrument satisfactory observations could be obtained by this method at a great saving of both field and office time over the methods previously adopted.

LAND SURVEYS

Throughout the year there has been a steady flow of inquiries from provincial and municipal authorities, lawyers, surveyors in private practice, and others for information about early surveys, methods of locating boundaries, land areas, reported errors in surveys, disputed boundaries, and other matters relating to the Dominion Lands system of survey in the western provinces. The inquiries varied from simple requests for information to knotty problems concerning the legality of surveys and procedure, and the interpretation of regulations. Long and careful research and expert attention was required in the preparation of the replies, and in all about 1,200 communications were dealt with, about 180 sketches prepared, and about 2,000 areas furnished.

Surveys in the Railway Belt of British Columbia.—One party was engaged for two months on surveys of a varied character made for the purpose of dealing with Dominion lands, and for five months on the survey of Indian reserves for the Department of Indian Affairs.

The miscellaneous work included the survey of two timber berths, the first along the Fraser river near Harrison Mills, while the second berth was composed of five separate blocks in the valley of the Coquihalla river. This latter survey was carried on under very trying conditions due to the high altitude and the lateness of the season when the work was undertaken.

Three surveys were made in the town of Hope, one of an Historic Site to commemorate the original Fort, another of a Park Reserve, and a third of a campsite for tourists. These two latter areas will be placed under a provincial parks board.

Other surveys consisted of the survey of a school site at Forde in the valley of the Columbia river, north of Golden, and two correction surveys in townships 3-29-6 and 17-14-6, respectively. The traverse of an unsurveyed island in Pitt river, township 40 E.C.M., now applied for, and a chained traverse of Intlpam creek, a tributary of the Fraser river in townships 17-27-6 and 17-28-6, completed the miscellaneous work for 1927 in the Railway Belt. Intlpam creek constitutes a boundary for three Indian Reserves belonging to the Lytton band and the issue of two township plans has been delayed pending the completion of this survey.

The surveys for the Department of Indian Affairs were made in accordance with an arrangement between that department and the Department of the Interior which was in operation in 1926 as well as in 1927, and the work done will enable the transfer of a large number of Indian Reserves set aside by a Royal Commission in 1916.

The establishment on the ground of the boundaries common to the Indian Reserves and the adjacent Dominion lands, as well as the ties made to the Dominion Lands system of survey, will be of considerable value in the disposal and administration of the Dominion lands involved, while there is the additional advantage that the standard of the work done will conform to the best practice for the surveys made solely for the disposal of Dominion lands. The permanency of the work is ensured so far as possible by the use of the standard survey posts for the establishment of all corner monuments.

Twenty-nine separate reserves were surveyed in 1927, situated for the most part along the Fraser river south of Lytton, while the balance were west of the Thompson River valley and north of Lytton.

In a number of the Indian Reserve surveys and in the survey of the camp-site for tourists at Hope, the limits of a railway right of way formed a part of the boundaries of the parcels to be defined, and the establishment of these limits

MAPPING IN THE ROCKY MOUNTAINS

The surveyor here is at a camera station located on the summit of one of the foot-hills of the Rocky Mountains and is in the act of taking precise mapping photographs for mapping purposes with his surveying camera, mounted upon its tripod. The view also shows the surveyor's transit for determining angles to other stations and to prominent points; and the type of signal—temporarily placed to one side—used to mark such a station after the surveyor leaves it.

on the ground presented considerable difficulty and increased the time required for the work quite appreciably. This was partly due to the fact that no permanent marks had been placed in the original survey of the right of way involved.

Surveys in Alberta.—The old Methodist Mission site at Morley in townships 26, ranges 6 and 7, west of the Fifth meridian, was surveyed many years ago and when the department recently undertook to grant title to the property the plan of survey was found too indefinite to be accepted under present-day standards and a retracement survey was made in order that a correct plan might

be prepared for passing title. Small subdivisions were made in township 77-24-5 and in township 77-3-6, in the Peace River district, to provide for squatters who were improving the land, and of individual quarter-sections in township 60-15-5 and township 11-1-5, which in each case had been withdrawn from a forest reservation because of being occupied. Miscellaneous surveys and investigations were made in eight other townships.

Surveys in Saskatchewan.—The northerly two-thirds of township 45-4-2, having been examined and found suitable for agricultural development, was withdrawn from Pasquia forest reserve and was subdivided into quarter-sections. That part of Fir river in the township was traversed and spirit levels were run along all the surveyed lines.

A small townsite on school lands was surveyed at Cloan on the Cutknife-Wilkie branch of the Canadian Pacific railway in township 42-20-3. The subdivision was made in compliance with the provincial town-planning regulations and comprised fifty-two business and residential lots and the usual public reserve.

A resurvey of four sections in township 10-5-2, withdrawn from Moose Mountain forest reserve, presented considerable difficulty owing to the original survey having been lost after part of the lands affected had become alienated. The boundaries as defined were accepted by all the interested parties, however, and have since been accepted by the Chief Surveyor for the Land Titles Offices of Saskatchewan. Miscellaneous surveys and investigations were made in eight other townships.

Surveys in Manitoba.—In order to prevent squatting on the Government reserve at Port Nelson a survey party was sent in to lay out the boundaries of the reserve. The reserve really comprised two reservations, the first being a tract two miles in depth along the northwest side of Nelson river extending from Seal island to Black Bear creek, a distance of fifteen miles, and the second for townsite purposes covering part of the same area, but extending about three miles deep. The survey was made so as to include both of these reserves. The boundaries were run out and monumented and the survey connected to monuments of the twenty-fourth base line of the Dominion Lands system of survey which passes through the reserve.

Cormorant lake at Mile 42 on the Hudson Bay railway has attracted a number of residents who desired a survey of the areas upon which they had squatted. On the recommendation of an inspecting officer some fifty-seven summer resort lots were laid out on a very fine point projecting into the lake and especially well suited for the purpose.

The land adjoining a bay on the south side of Atikameg lake at Mile 13 on the Hudson Bay railway was also laid out into eighty-nine villa lots with a large public reserve for picnic purposes centrally located therein.

Small surveys to assist in the administration of Dominion lands were made in township 60-21-W, and one section was laid out in township 59-21-W to include the improvements of squatters in that township.

Surveys in Other Localities.—In the Northwest Territories a few lots were laid out at Gravel Point on Slave river for the use of the Northern Navigation Company. Historic sites were surveyed for the National Parks of Canada Branch at Fort Beauséjour, New Brunswick; at Soulanges, Quebec; and at Ridgeway and Longwoods, Ontario.

The survey of quartz mining claims in the Rice Lake, Herb Lake, and The Pas mining districts of Manitoba and in the Yukon Territory was continued. Instructions were prepared in detail for the survey of 170 claims, and the returns of survey of 150 claims, many of which were in triplicate, were examined for approval.

Plans of survey of new roads to the number of 302 were submitted by the western provinces to the Surveyor General for examination and acceptance as required by statute in order to acquire title to the right of way.

Forty-eight plans of survey of railway right of way were examined for approval by the Surveyor General prior to being used by the department and thirty other miscellaneous plans were examined to determine whether they were sufficient for departmental purposes.

In addition to the foregoing, 97 township plans and 25 miscellaneous plans were prepared for the draughtsmen and 150 draughted plans were compared with the compiled plans and passed for approval.

In connection with the foregoing 7,034 recorded books and plans were consulted.

LAND CLASSIFICATION SURVEYS

Land classification surveys during the year were carried on by a party under G. J. Lonergan, D.L.S., in or in the neighbourhood of Dominion forest reserves in the provinces of Saskatchewan and Alberta. A total of 434,080 acres were so classified.

For those areas outside of forest reserves these surveys provided a basis for the selection of lands adapted to forestry purposes; and in the case of areas within forest reserves, for the selection of arable lands which could be recommended for withdrawal.

In the province of Saskatchewan the examination was carried on within part of Porcupine No. 2 and Keppel forest reserves, all of Elbow forest reserve and surrounding lands, and the lands adjacent to part of the present boundaries of Big River forest reserve. The acreage classified within the province comprises 192,320 acres within forest reserves and 94,400 acres of lands adjacent to reserves, or a total of 286,720 acres.

In the province of Alberta the classification was confined to part of the proposed Kehiwin forest reserve and involved 147,360 acres.

The field returns were checked in the office and the data compiled and tabulated for use. Instructions for further field work were also prepared. To make available, for consultation by prospective settlers, and other interested parties, the information obtained in the districts investigated, standard portfolios of township development plans and bound district reports were prepared for the Dominion Lands agencies and sub-agencies covering the districts affected. In addition, similar information was supplied to the Dominion Forest Service, the colonization and development departments of the two principal railway systems, provincial officials, and to a few others to meet special requests. The total distribution thus made comprised eleven portfolios and five district reports.

In order to provide for and meet demands from various sources, a revised edition of the map "Index to Land Classification and Soil Maps" was published. Similarly, the map of the main soil types of the Lac la Biche district issued in 1922 being nearly out of print a new and up-to-date edition of it was issued.

PRECISE DECLINATION SURVEYS

During 1927, precise declination surveys were continued by the survey parties and some 1,300 measurements of the true compass needle direction were made from coast to coast, bringing the total number to date to more than 23,000.

More than 300 of these measurements were made by Ontario Government surveyors under direction of L. V. Rorke, Esq., Surveyor General, Ontario Department of Lands and Forests, under a co-operative program whereby the Ontario Government surveyors make these measurements on their work, while

this Survey looks after their compasses and makes the necessary office computations; the final results being available to both Governments. Thus the measurements of the Ontario Government and of this Survey, being mutually supplementary, result in a more expeditious and economical survey and fewer gaps.

A new declination map, "Lines of Equal Magnetic Declination and Annual Change in Canada for 1927," was published, being the latest declination map in the series published by this Survey at five-year periods: 1907, 1912, 1917, 1922, 1927. During the year twenty-seven small declination maps were compiled for publication on the sheets of the Sectional Map series, National Topographic series, etc., to supply up-to-date practical compass information to those using the maps. It was arranged to co-operate with the Canadian Hydrographic Service of the Department of Marine and Fisheries, and during the year practical compass information was supplied for their charts of the Great Lakes, and Hudson bay and strait.

MEASURING THE COMPASS CHANGE IN NORTHERN CANADA

Observing tent at Aklavik, N.W.T., in the Mackenzie river delta, north of the Arctic Circle, in which B. H. Segré, D.L.S., observed the change of the compass needle direction from hour to hour at intervals during an entire winter.

As the compass needle changes its direction from year to year and by a different amount at each place, precise declination repeat observations are required in order to keep the measurements already made up-to-date. This is an aid in retracing or re-establishing old or lost land boundaries run by compass many years ago, and in correlating surveys made at different dates. During 1927 these measurements were continued at many important points by the survey parties in close co-operation with the provinces.

In co-operation with some of the provinces, meridian stations were established in conjunction with repeat stations and permanently marked for the convenience of provincial surveyors in standardizing the compasses of their theodolites. A Dover dip circle was employed for measuring the intensity and dip and observations were obtained at seventeen stations.

The magnetic instruments were standardized at the beginning and end of the season at the Magnetic Observatory, Agincourt, Ont., through the courtesy of Sir Frederic Stupart, Director of the Meteorological Service of Canada, so that all results were reduced to International Magnetic Standard.

Field parties were supplied with instructions and directions, and in some cases practical demonstrations of observing were given; while the instruments were inspected, repaired when necessary, mounted, adjusted and calibrated, and kept in good condition, and the index corrections determined.

Considerable correspondence was carried on with other governments, scientific authorities, commercial firms and individuals. A report on the location of the north magnetic pole on the Arctic coast of Canada was made for the United States Federal Board of Surveys and Maps. The computation, reduction and preparation of returns for publication, including corrections for daily and yearly changes, etc., were carried out as in the past; and the stations plotted on sheets of the Sectional Map series, National Topographic series, etc. Researches were made in diurnal variation and secular change with the object of still further improving the work and handling it even more expeditiously and economically. Several reports and short articles describing the work were written for different purposes, and a lecture on "The Romance of the Compass" was given before three societies.

PHYSICAL TESTING LABORATORY

Both the testing operations and the work done in the instrument shop at the Physical Testing Laboratory continue to increase. Originally established to test the new instrumental equipment purchased by the Topographical Survey, the laboratory has grown considerably and now over 60 per cent of the work handled is done on behalf of other Government organizations.

General Instruments.—Owing to the volume of routine work dealt with, much time could not be devoted to making investigations. A start was made on the complete calibration of the horizontal circle of a Wilde precision theodolite for the Geodetic Survey, but it was found impossible to devote sufficient time to this operation before the instrument was required for the field.

Three duff hygrometers, for indicating the percentage of moisture in forest floors, were calibrated for the Dominion Forest Service and will be given a trial under practical conditions during the summer.

Investigations were also made on behalf of the National Parks of Canada Branch of the Department, in connection with a special instrument to be used in the quicker detection of forest fires.

Metrology.—The Laboratory standards of length, nickel rule No. 306, and 42 per cent nickel-steel rule No. 224, were taken to the National Physical Laboratory by one of the members of the staff who was visiting England on holiday, and there compared with the British standards. A very complete comparison was made, employing four rules in a closed series, and including Parliamentary Copy No. VI of the Imperial yard. The comparison indicated that the rules had not changed appreciably since 1924, when they were last verified against British and metric prototype standards.

The Physical Testing Laboratory rules, therefore, have a particular value in that they have been submitted to careful comparisons with both the platinum-iridium metre No. 26 at Sèvres, France, and Parliamentary Copy No. VI of the Imperial yard at London, England, these two rules each being only one step removed from the primary standards of the units they respectively represent.

The work on the old Canadian standards was concluded. A direct comparison was made between the Dominion Standard Yard "A" and the surviving Parliamentary Copy "B", carrying out the provisions of the Weights and Measures Act. Incidentally, owing to the advantage of conducting the operation in the new one-metre comparator of the Laboratory, it may be stated that this is probably the most accurate comparison that has been made between these rules. The Parliamentary Copy "B" of the Standard Yard showed a change

of 0·000278 inch from its original length as certified by the British Deputy Warden of the Standards in 1874. This amount is considerably more than the change shown by the Dominion standard "A" (0·000066 inch).

The Department of Trade and Commerce has a bronze yard, cast in 1845 and received in Canada about 1855, probably the oldest standard in Canada. This rule is of historical interest as it is one of some forty bronze rules prepared under the instructions of a commission appointed by the British Parliament in 1838 to prepare new standards to replace those destroyed by fire in 1834. Several prominent scientists of that time were on the commission and one of the most complete studies of standard yard rules ever made was carried out by them. One of the forty rules previously mentioned became the Imperial Standard Yard, the fundamental standard of length for the British system of weights and measures. Several of the other bronze rules were distributed throughout the world, one, No. 16, similar in every way to the one chosen for the Imperial standard, being sent to what was then the Colony of Canada.

WITH PACK-TRAIN UP PROPHET RIVER

During the season the Halfway River and Prophet River country in northeastern British Columbia was explored and mapped by K. F. McCusker, D.L.S. In travelling to the source of Prophet river, which rises on the eastern slopes of the Rocky mountains, it is necessary to ford frequently.

No. 16 was found to be in good condition when examined at the Physical Testing Laboratory and bears clear, fine defining lines. A test made of its length showed that it had changed very little in reference to the Imperial yard. A noticeable feature was that No. 16, like "A and "B," which are relatively newer rules, has shortened in respect to the Imperial yard.

A bulletin, now nearly ready for the press, contains a complete description of the study of the yard Standards made by the Physical Testing Laboratory.

A re-determination was made during the winter of the equation of the 4-metre invar rule employed in measuring the 32-metre comparator base. The equation of invar rule No. 191 had been previously determined by means of the one-metre comparator, which is designed for the absolute measurement of thermal dilatations. This rule was then used to measure the length of the 4-metre rule at a series of temperatures in the range 2° C. to 30° C.

The equation of the 4-metre rule is of some importance, as it is employed from time to time in determining the thermal dilatations of metal tapes.

This section tested 115 hydrometers, for use by the Department of National Revenue for excise and customs purposes.

Thermometry.—In the thermometry section a new platinum resistance thermometer with very small lag and a fundamental interval of 10 ohms was added to the equipment. This instrument will be a valuable check for the mercury standards and will also be of great assistance in determining the internal pressure corrections for the thermometers used in the precise length determinations made by the Laboratory. Precision mercury standard thermometers are usually standardized in the vertical position, as this is the position used for most purposes. In length determinations, however, the thermometers have to be used, as a rule, in the horizontal position. The indication of a mercury thermometer at the same temperature will vary as it occupies these two positions due to the mercury distending the bulb by different amounts according to its effective head. The difference may amount to as much as 0.05° C. for a particular thermometer. In the platinum resistance thermometer no such effect is present and it therefore becomes a useful intermediate standard for verifying the "horizontal" mercury thermometers in terms of the Laboratory primary standards.

During the year this section verified 4,345 thermometers for various organizations, including 2,860 clinical thermometers, and 1,330 mercury thermometers for the Grain Commission, besides conducting a large number of tests of the thermometers used in connection with the regular Laboratory operations.

Barometers and Aeronautical Instruments.—Due to difficulty in obtaining suitable space it was found impossible to complete the installation of a refrigerator, which was received during this year. However, there is a good prospect of acquiring accommodation in the near future, and as soon as possible the refrigerator will be put into operation. By this means the facilities for making low temperature tests will be greatly extended.

The usual quantity of surveying aneroids, altimeters, air-speed indicators, bank and turn indicators, and allied instruments were tested, adjusted, and calibrated and specifications were prepared for some surveying aneroid barometers for the Topographical Survey. These barometers have been ordered and should be to hand early next year. They incorporate a number of improvements found desirable through the experience of the Laboratory extending over several years, and should be superior to any aneroid barometer at present on the market.

Instrument Shop.—More and more demands are made on the shop by other Government organizations requiring repairs to instruments of precision, or the construction of special instruments not obtainable commercially. Four skilled instrument-makers are employed, but they are not sufficient to comply with all the demands made for assistance.

Among the items of interest constructed in the shop during the year were office stereoscopes for viewing vertical aerial photographs and a navigating sight to be used on aeroplanes engaged in photographic surveying operations.

REGISTRATION, RECORDS AND DISTRIBUTION

The work of this division comprises the following: registration and recording of all the various returns of surveys received from the surveyors in the field, and of the plans of rights of way, roads, mineral claims, Indian reserves, etc.; furnishing copies of field notes and traverse plots as required; dealing with technical correspondence relating to the surveyors' field notes; storing

and distributing of the official plans of townships, townsites, settlements, etc.; distribution of the various maps and publications issued by the branch; and other related work.

The following survey returns were received for examination from surveyors in the field, railway companies, and provincial governments, and were entered in the various registers, plotted on the various index maps, etc.: 305 books of field notes, 411 plans, and 2,963 miscellaneous returns consisting of notes of magnetic surveys, progress sketches, various reports, etc.

THE AERIAL PHOTOGRAPH IN THE STUDY OF LAND FORMS

This vertical aerial photograph of the valley of Oldman river some fifteen miles northeast of Lethbridge was taken at a height of 10,000 feet with a camera equipped with a lens of 12 inches focal length. With the next overlapping photograph, when viewed under the stereoscope, a remarkably clear picture of the valley with its tributary coulées and ravines, is presented. This illustrates one of the many uses for vertical aerial photographs when taken with a proper forward overlap, namely, their use when viewed under the stereoscope, in the study of land forms and physical geography.

On the completion of the examination, the field books and various original plans are placed on record. There is also recorded the signed copy of each official plan issued by the branch. During the year 296 new books and 612 new plans were placed on record. The total number on record is now 19,969 books of field notes and 35,672 plans.

The work of dealing with requests for technical information relating to surveys and survey records was carried on as usual. These requests are received from various branches of the federal and provincial governments, surveyors and engineers, law firms, and from the general public, and relate to survey monuments, conflicting boundaries, etc. This involves not only the searching of the surveyors' field notes and files but in many cases the supplying of copies of the notes and the preparation of survey sketches. When required for the law courts the copies of the notes and plans are officially certified. Four hundred and sixty-nine such requests were dealt with.

The number of copies of the plans of townships, settlements and townsites received and stored was 7,651. The number of copies distributed during the same period was 23,155.

Various maps, technical pamphlets, reports, etc., were distributed throughout the year as usual. During the twelve months there were distributed 33,651 maps and 3,271 publications. In the distribution of these 9,131 requests were dealt with, being 2,013 more than for the year before.

The most important maps issued during the year were the following: Lake Louise, Sussex, and New Glasgow sheets of the National Topographic series on a scale of one mile to an inch; Rouyn-Larder Lake and Rouyn Lake sheets of the same series on a scale of two miles to an inch, and Trout Lake, The Pas, Cormorant Lake, Wekusko Lake, and Grand Rapids sheets of this series on a scale of four miles to an inch. The greatest demand was for the maps of the mining areas such as Rouyn-Larder Lake and Rouyn Lake maps, and the Cormorant Lake map showing the mining area in northern Manitoba. Reprints had to be prepared of the map of The Pas mineral area which includes the Sherritt-Gordon properties and of the Reindeer Lake area where new discoveries have recently been made. Of the Sectional Map series the most important were the Weyburn and Touchwood maps Nos. 20 and 169, respectively, which were issued for the first time in the new series on a scale of three miles to an inch. Another map which proved of considerable interest was the map of Churchill Harbour on a scale of 2,000 feet to an inch. Two technical publications were issued, viz., a nomogram showing the duration of sunlight for every day in the year for all places in the world, and a pamphlet entitled " A Graphical Method of Plotting Oblique Aerial Photographs ".

MECHANICAL OPERATIONS

The Mechanical Division includes the drafting rooms, the photographic and lithographic offices, and the relief map room. This division takes the copy prepared by the compilers, makes a drawing of it suitable for reproduction, photographs it to zinc or stone, and prints an edition. The compiled copy may come from any of the divisions of the Survey, or whenever the facilities of the Survey will permit from some other source outside the branch.

In addition to the principal work of printing editions of maps and plans, there is done related work such as the photographing of maps, plans, sketches, plane table sheets, etc., to any required scale, and supplying prints therefrom; copying or photographing to required scale mosaics made from aerial photographs; making half-tones and line cuts; pulling proofs of maps in any required combination of colours; and making blue-line prints for the use of draughtsmen.

The following list summarizes the more important maps, plans, etc., drafted, photographed, and lithographed:—

	No.	Total Copies
National Topographic series sheets	10	21,025
Sectional Map series sheets	15	14,250
B.C.-Alta. Boundary sheets	8	9,760
Canadian National Park map sheets	2	8,250
Land survey plans	72	11,030
Land classification sheets	2	3,200
Miscellaneous	19	23,875

Relief map models were prepared for the following: Edmonton district, Sussex, New Glasgow, Lake Louise, Kamloops, Rockcliffe, Soulanges Rapids, and Niagara River Power area. Twenty-eight framed copies, partly of the above and the remainder of models in stock from previous years, were completed. Displays of relief maps were prepared and shown at the World's Poultry Congress held in Ottawa, and at the Central Canada Exhibition.

GEOGRAPHIC BOARD OF CANADA

During the year the Geographic Board, which is the central authority for geographic names throughout the Dominion, sent to the press its nineteenth report containing all decisions from April 1, 1924, to July 31, 1927. A booklet giving the meaning of Alberta place-names, based on the records of the board, was also printed and the preparation begun of a similar publication dealing with the place-names of Manitoba.

Mr. J. D. Craig, Director General of Surveys, was elected chairman of the board in succession to the late Mr. James White. The secretary is an officer of the Department of the Interior.

BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS

The Board of Examiners for Dominion Land Surveyors held two meetings during the year.

The first was a special meeting lasting from Monday, May 2, 1927, to Monday, June 6, 1927 (inclusive), during which examinations were held at Ottawa, Vancouver, Winnipeg, and Sackville.

The second was the regular annual meeting called for by Section 9 of the Dominion Lands Surveys Act. It opened on Monday, February 13, 1928, and lasted until Friday, March 16, 1928 (inclusive). During this meeting examinations were held at Ottawa, Winnipeg, Calgary, and Saskatoon.

The total number of candidates who presented themselves at the examinations was seventy. Of these, forty-two tried the Preliminary Examination, nine tried the Final Examination, eighteen tried the Levellers' Examination, and one tried the Examination for Dominion Topographical Surveyors.

Twenty-one candidates were successful at the Preliminary Examination as follows:—

Aitkens, J. C., Winnipeg, Man.
Bennett, T. E., Saskatoon, Sask.
Clark, R. W., Saskatoon, Sask.
Dore, J. I., Ottawa, Ont.
Fenton, T. C., Winnipeg, Man.
Gray, Norman G., Sackville, N.B.
Hardy, R. McD., Winnipeg, Man.
Johnston, C., Saskatoon, Sask.
Keddie, W. M., Ottawa, Ont.
Leak, R. W., Calgary, Alta.
Loney, W. J., Ottawa, Ont.

McCalpin, L. A., Winnipeg, Man.
McLeod, R. M., Winnipeg, Man.
McLauchlan, D. W., Sackville, N.B.
Mould, J., Saskatoon, Sask.
Muir, W. G., Sackville, N.B.
Pidoux, J. L., Calgary, Alta.
Pounder, T. J., Winnipeg, Man.
Striowski, J. B., Winnipeg, Man.
Strong, J. I., Saskatoon, Sask.
Whitehorn, L. N., Calgary, Alta.

Four candidates were successful at the Final Examination as follows:—

Bostock, W. N., Vancouver, B.C.
Hatton, G. P., Ottawa, Ont.
Phillips, E. K., Saskatoon, Sask.
Webber, G. E., Winnipeg, Man.

Nine candidates were successful at the Levellers' Examination as follows:—

Baptie, P. B., Calgary, Alta.
Dore, R. F., Ottawa, Ont.
Gorman, R. H., Ottawa, Ont.
MacPherson, E. J., Ottawa, Ont.
Miller, C., Ottawa, Ont.
Miller, F., Vancouver, B.C.
Morrison, R. L., Vancouver, B.C.
Turnbull, T. A., Vancouver, B.C.
Warden, T., Vancouver, B.C.

The time of the board during the meetings was largely taken up with the reading and valuation of the candidates' answer papers. Complete sets of question papers to be used at the following examinations were also prepared.

Six commissions were issued to candidates who had passed the Final Examination and had furnished oaths of office and allegiance and bonds for the sum of $1,000, as required by section 25 of the Dominion Lands Surveys Act.

Three certificates of preliminary examination were issued to successful candidates who had complied with the requirements of the law.

Nine certificates as levellers were issued to candidates who had successfully passed the examination.

Seven new standard measures of length were issued during the year and one old tape was tested and reissued.

The Board of Examiners made a change in the program of subjects for the final examination in so far as the subject "Theory, Adjustment and Use of Instruments" was concerned. Reference to this subject was amended in the eleventh edition of *Rules and Regulations of the Board* to read as follows:—

> *Theory, Adjustment and Use of Instruments.*—The Theory, Adjustment and Use of Instruments which are in common usage in making land and topographical surveys: the chain, compass, transit, level, sextant, clinometer, aneroid, barometer, plane table, and other instruments.
>
> Text-book: Johnson & Smith—Theory and Practice of Surveying, Chapters I to VI, and Chapter VIII.
>
> The above to become effective commencing with the examinations held in 1929.

APPENDIX

SCHEDULE OF SURVEYORS EMPLOYED AND WORK EXECUTED BY THEM

BENNETT, G. A.—

The completion of the topographical survey (plane table) of the Fredericton one-mile sheet 21 G/15, of the National Topographic series, which sheet is included within north latitudes 45° 45′ and 46° 00′ and longitudes 66° 30′ and 67° 00′ west of Greenwich; control surveys for the topographical mapping of the Moncton two-mile sheet No. 21 I/S.E. included within north latitudes 46° 00′ and 46° 30′ and longitudes 64° 00′ and 65° 00′ west of Greenwich; observing the magnetic declination and establishing magnetic meridian stations at different points in the province of New Brunswick; the survey of Fort Beausèjour Historic Park.

BLANCHET, G. H.—

Exploration and investigation in the Fort Smith Wood Buffalo Park; survey of group lots on Slave river, N.W.T.

BRIDGLAND, M. P.—

The topographical survey (plane table) of the Calgary Southwest one-mile sheet No. 82 J/16 and a part of the Calgary Northwest one-mile sheet No. 82 O/1, which sheets are included within north latitudes 50° 45′ and 51° 00′ and longitudes 114° 00′ and 114° 30′ west of Greenwich, and north latitudes 51° 00′ and 51° 15′ and longitudes 114° 00′ and 114° 30′ west of Greenwich, respectively; the continuation of the photo-topographical survey of the Revelstoke two-mile sheet No. 82 L/N.E., which sheet is included within north latitudes 50° 30′ and 51° 00′ and longitudes 118° 00′ and 119° 00′, west of Greenwich; photo-topographical surveys along the proposed new eastern boundary of Jasper park.

CALDER, J. A.—

Timber Berth surveys in townships 3-29-6 and 9-23-6; correction surveys in townships 17-14-6 and 3-29-6; traverses in townships 17-27-6, 17-28-6 and 40 E.C.M.; Historic Site, Park Reserve and campsite in Tp. 5-26-6; Schoolsite in township 29-23-5; Indian Reserve surveys in townships 8-25-6, 8-26-6, 9-26-6, 10-26-6, 11-26-6, 12-26-6, 15-26-6, 17-26-6, 14-27-6, 17-27-6, 21-27-6 and 17-28-6.

CARROLL, J.—

Vertical aerial photographic surveys covering Muskoka topographic map sheet No. 31 E/S.W. in Ontario, Buckingham and La Tuque sheets Nos. 31 G/N.W. and 31 P/S.E., which sheets are included within north latitudes 45° 00′ and 45° 30′ and longitudes 79° 00′ and 80° 00′, west of Greenwich, and north latitudes 45° 30′ and 46° 00′ and longitudes 75° 00′ and 76° 00′., respectively, and the Chicoutimi district, in Quebec.

CHRISTIE, W.—

Subdivision in townships 59-21-Pr., 60-21-Pr., and 45-4-2; survey of boundaries of Port Nelson Government reserve; intensive subdivision at Cormorant lake and Atikameg lake along the Hudson Bay railway.

COWPER, G. C.—

Topographical mapping for the first field revision of the Humboldt sheet, No. 219, of the Sectional Map series, comprising townships 33 to 40, ranges 15 to 29 inclusive, west of the Second meridian; renewal of monuments.

CUMMING, A. L.—

The topographical survey (plane table) of the Yarmouth and Comeau Hill one-mile sheets, Nos. 20 0/16 and 20 0/9, of the National Topographic series, which sheets are included within north latitudes 43° 45′ and 44° 00′ and longitudes 66° 00′ and 66° 30′ west of Greenwich, and north latitudes 43° 30′ and 43° 45′ and longitudes 66° 00′ and 66° 30′ west of Greenwich, respectively; observing magnetic declination and establishing magnetic meridian stations at different points in the province of Nova Scotia.

DAVIDSON, R. D.—

Oblique aerial photographic surveys covering a portion of the Wood Buffalo reserve in Alberta, the Prince Albert National Park in Saskatchewan, the Flin Flon mining district in Saskatchewan and Manitoba, and a portion of the Ignace topographic map sheet No. 52 G in Northwestern Ontario; vertical aerial photographic surveys in the vicinity of Cormorant lake in Manitoba, and Namakan lake in the Rainy River district, Ontario.

DONNELLY, C. B. C.—

Vertical aerial photographic surveys covering Shelburne two-mile sheet, No. 20 P/N.W., in Nova Scotia, which sheet is included within latitudes 43° 30′ and 44° 00′ and longitudes 65° 00′ and 66° 00′ west of Greenwich.

FLETCHER, W. A.—

Control surveys for topographical mapping on a scale of two miles to the inch from vertical aerial photographs of Buckingham and Lachute sheets of the National Topographic series, which sheets are included within latitudes 45° 30′ and 46° 00′ and longitudes 74° 00′ and 75° 00′ west of Greenwich, and latitudes 45° 30′ and 46° 00′ and longitudes 75° 00′ and 76° 00′ west of Greenwich, respectively.

FRY, E. S.—

Oblique aerial photographic surveys covering Kenora sheet, No. 52 E, in Ontario and Manitoba, and Berens River sheet, No. 63 A, in Manitoba, and portions of Dryden sheet No. 52 F in Ontario, and Deer Lake No. 53 D, Gypsumville No. 62 O, Hecla No. 62 P, Waterhen No. 63 B, Swan River No. 63 C, and Norway House No. 63 H in Manitoba; vertical aerial photographic surveys in the Flin Flon district, Manitoba and Saskatchewan.

GORMAN, A. O.—

Survey of Cloan townsite in township 42-20-3; retracement of Morley Mission property in townships 26-6-5 and 26-7-5; extension of subdivision in townships 10-5-2, 11-1-5, and 60-15-5; miscellaneous surveys in townships 18-1-2, 19A-5-2, 20-21-2, 41-15-3, 11-26-3 and 51-25-4; traverses and investigations of water areas in townships 25-4-2, 25-5-2, 51-26-4, 6-2-5 and 24-4-5.

LAMBART, H. F. J.—

Photo-topographical surveys along the proposed new northern boundary of Jasper National park.

LONERGAN, G. J.—

Examination and classification of lands within and adjoining forest reserves and comprised within the following townships: townships 36, ranges 30 and 31; township 37, range 32, west of the Principal meridian; townships 37, ranges 1, 2, 3 and 4; township 38, range 1, west of the Second meridian in Porcupine Forest reserve No. 2; townships 23 and 24, ranges 2, 3, and 4; townships 24 and 25, ranges 5, 6 and 7, west of the Third meridian, in and adjacent to Elbow Forest reserve; townships 36, ranges 12 and 13; township 37, range 12, west of the Third meridian in Keppel Forest reserve; townships 51, ranges 12, 13 and 14; township 52, range 13; and townships 53 and 54, ranges 12 and 13, west of the Third meridian, adjacent to Big River Forest reserve; townships 57, 58, 59 and 60, range 3; townships 58, 59 and 60, range 4; and townships 58, 59 and 60, range 5, west of the Fourth meridian, in the proposed Kehiwin Forest reserve; miscellaneous surveys in townships 48-28-3 and 52-26-4; investigation of water areas in townships 53-2-4, 67-13-4 and 68-15-4.

MACDONALD, C. S.—

Topographical mapping for the second field revision of the Selkirk four-mile sheet, No. 62 I, of the National Topographic series, which sheet is included within north latitudes 50° 00′ and 51° 00′ and longitudes 96° 00′ and 98° 00′, west of Greenwich; observing for latitude and longitude.

MCCUSKER, K. F.—

Topographical mapping (exploratory) of the Halfway River and Prophet River four-mile sheets, Nos. 94 B and 94 G, of the National Topographic series, which sheets are included within north latitudes 56° 00′ and 57° 00′ and longitudes 122° 00′ and 124° 00′ west of Greenwich, and north latitudes 57° 00′ and 58° 00′ and longitudes 122° 00′ and 124° 00′ west of Greenwich, respectively; extension of subdivision in townships 77-24-5 and 77-3-6.

PIERCE, J. W.—

In co-operation with the Surveys Branch of the Ontario Department of Lands and Forests, control surveys for topographical mapping on a scale of two miles to the inch from vertical aerial photographs, comprising the areas between latitudes 44° 30′ and 45° 30′ and longitudes 79° 00′ and 80° 00′ and between latitudes 45°00 and 45° 30′ and longitudes 80° 00′ and 81° 00′, west of Greenwich; survey of historic sites at Ridgeway in Welland County and at Longwoods, Middlesex County, Ontario.

RINFRET, C.—

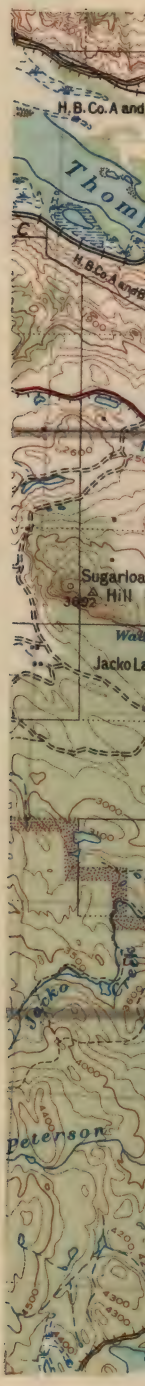
Control surveys and topographical mapping on the Beaupré two-mile sheet, No. 21 M/S.E., of the National Topographic series, which sheet is included within north latitudes 47° 00′ and 47° 30′ and longitudes 70° 00′ and 71° 00′ west of Greenwich; observing magnetic declination, dip and total force and establishing magnetic meridian stations at different points in the province of Quebec; survey of historic site at Soulanges, Quebec.

RUSSELL, J.—

Oblique aerial photographic surveys covering a portion of the Wood Buffalo reserve in Alberta, the Prince Albert National Park in Saskatchewan, and a portion of the Ignace four-mile sheet, No. 52 G, of the National Topographic series, which sheet is included within north latitudes 49° 00′ and 50° 00′ and longitudes 90° 00′ and 92° 00′, west of Greenwich.

TAGGART, C. H.—

Control surveys and topographical mapping on the Kamloops Lake two-mile sheet No. 92 I/N.E., of the National Topographic series, included within north latitudes 50° 30′ and 51° 00′ and longitudes 120° 00′ and 121° 00′ west of Greenwich, on the Shuswap Lake two-mile sheet No. 82 L/N.W., included within north latitudes 50° 30′ and 51° 00′ and longitudes 119° 00′ and 120° 00″, west of Greenwich, on the Yale two-mile sheet No. 92 H/N.W., included within north latitudes 49° 30′ and 50° 00′ and longitudes 121° 00′ and 122° 00′, west of Greenwich, and on the Lytton two-mile sheet No. 92 I/S.W., included within north latitudes 50° 00′ and 50° 30′ and longitudes 121° 00′ and 122° 00′, west of Greenwich.


H.B.Co.A and
Thom
H.B.Co.A and
Sugarloa
Hill
3692
Jacko La
Jacko
Peterson

DEPARTMENT OF THE INTERIOR

TOPOGRAPHICAL SURVEY

A small portion of the Kamloops Lake sheet, No. 92 $\frac{I}{NE}$

NATIONAL TOPOGRAPHIC SERIES

Scale 2 miles to 1 inch

Contour interval 100 feet.

DEPARTMENT OF THE INTERIOR

TOPOGRAPHICAL SURVEY

A small portion of the Kamloops Lake sheet, No. 82 ♔

NATIONAL TOPOGRAPHIC SERIES

Scale 2 miles to 1 inch

Contour interval 100 feet

SYSTEM OF NUMBERING SHEETS

(See diagram at upper right hand corner)

The basis of the index is a unit 4° in latitude by 8° in longitude. Sheets taking in the full unit on the scale of sixteen miles to one inch are numbered on the index thus 53

EIGHT-MILE SHEETS: Each sixteen mile sheet is quartered into sheets of scale eight miles to one inch named respectively, N.W., N.E., S.W., S.E.; the number taking the form thus ..... 53 N.W.

FOUR-MILE SHEETS: Each sixteen mile sheet is divided into sixteen sheets of scale of four miles to one inch lettered regularly from A to P as shown on the diagram, the number taking the form thus..... 53 G

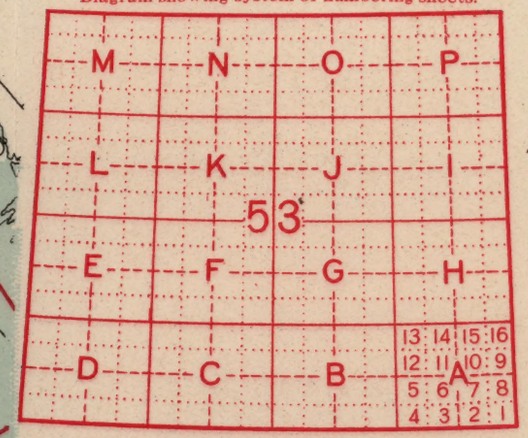
TWO-MILE SHEETS: Each four mile sheet is quartered into sheets of scale two miles to one inch named respectively, N.W., N.E., S.W., S.E.; the number taking the form thus ..... 53 A/N.W.

ONE-MILE SHEETS: Each four mile sheet is divided into sixteen sheets of scale one mile to one inch numbered from 1 to 16 as shown on the index, the number taking the form thus..... 53 A/7

Every sheet will also be given a name indicating its location by reference to the largest city or town in it, or by reference to some well known geographical feature.

NOTE: This skeleton index map is intended only to furnish a general idea regarding the system of numbering the map sheets of the National Topographic Series. Index maps on a larger scale with more complete information are available upon application.

Diagram showing system of numbering sheets.



Every numbered unit in the main index is subdivided the same as the above, which, for clearness is shown on a scale larger than the map below.

Areas covered by sheets of the

NATIONAL TOPOGRAPHIC SERIES

(And other map sheets)
Up to April 1, 1928
BY THE
TOPOGRAPHICAL SURVEY
DEPARTMENT OF THE INTERIOR

National Topographic map sheets issued, thus.....
National Topographic map sheets in hand, thus.....
Other map sheets issued, thus .....

BASE MAP FROM CHIEF GEOGRAPHER'S MAP OF THE DOMINION OF CANADA

PHOTO-ZINCOGRAPHED AT THE TOPOGRAPHICAL SURVEY OF CANADA, OTTAWA

CARTE INTERNATIONALE DU MONDE AU 1,000,000e
INTERNATIONAL MAP OF THE WORLD 1:1,000,000

REGINA

N. M-13

Compiled, drawn and published by the Topographical Survey, Department of the Interior, Ottawa, Canada. June, 1932
Dressé, dessiné et publié par le Service topographique, Ministère de l'Intérieur, Ottawa, Canada. Juin, 1932

Topographical Survey of Canada Maps 1:250,000
Cartes topographiques du Service topographique du Canada au 1/250,000

Compiled from International Boundary Maps 1:62,500
Compilé d'après les cartes internationales de la frontière par le United States Geological Survey

Topographical Survey of Canada Maps 1:62,500
Cartes du Service topographique du Canada au 1/62,500

Topographical Survey of Canada Maps 1:250,000
Cartes du Service topographique du Canada au 1/250,000

Topographical Survey of Canada Maps 1:62,500
Cartes des frontières au 62,500e

Topographical Survey of Canada Maps 1:62,500
Cartes topographiques du Service topographique du Canada au 1/62,500